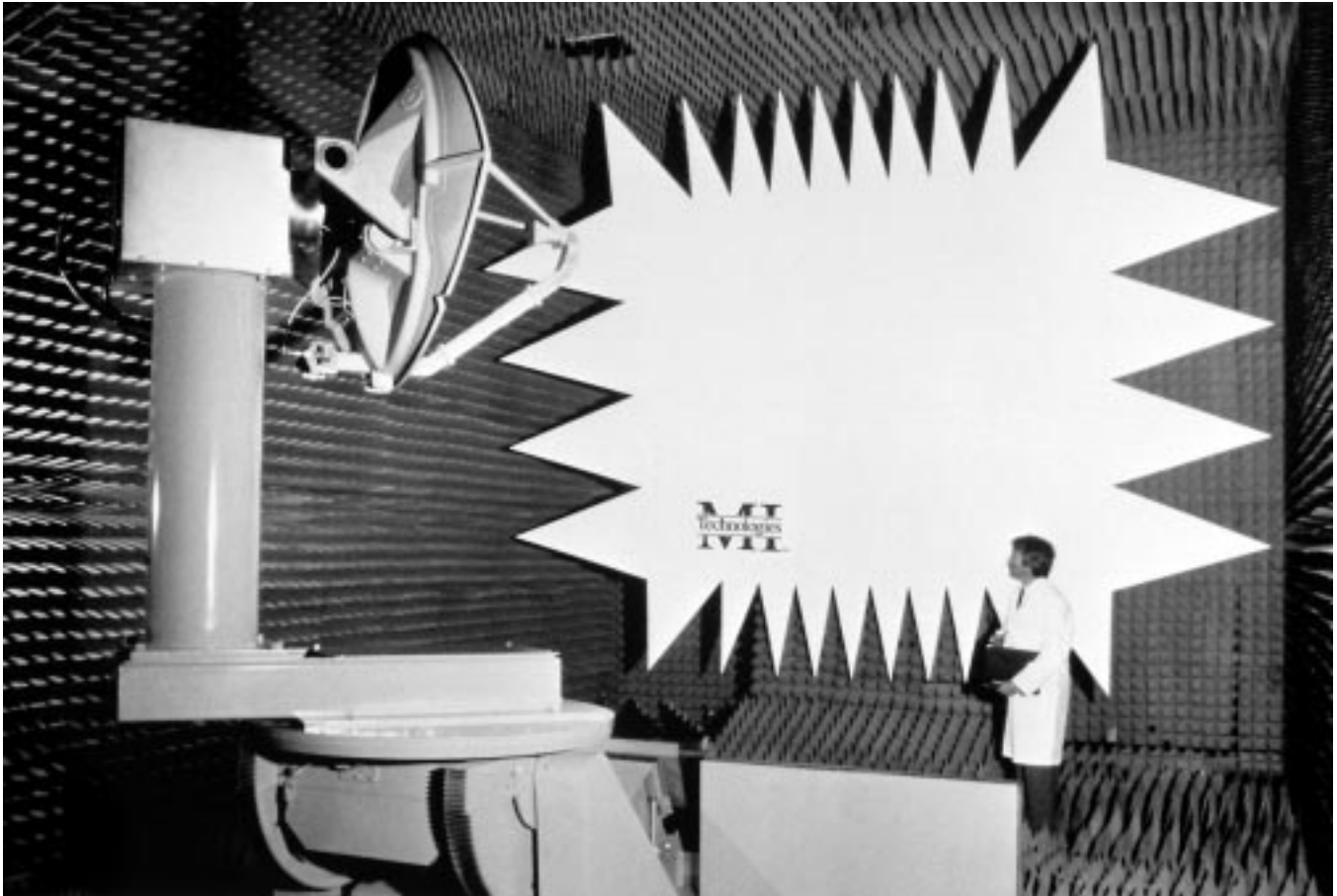


Products - Compact Ranges

Series 5700 Compact Ranges



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Features

- Virtual vertex design reduces feed interaction and backscatter into the test zone
- Wide frequency coverage from 1 GHz to 110 GHz
- Single reflector, prime focus design avoids the disadvantages of dual-reflector systems
- Precisely machined, monolithic surface eliminates complicated panel alignments and realignments
- Unique serrated reflector edges minimize edge diffraction effects
- Temperature-stable, steel back structures provide superior stiffness

Description

The Series 5700 Virtual Vertex Compact Range family is designed for accurate, indoor antenna and radar cross-section (RCS) measurements. A compact range allows plane wave illumination, normally achieved by use of a large distance between the microwave source and the antenna or target under test, to be realized in a small space.

The compact range's reflector is its most prominent feature. A feed antenna radiates a controlled spherical wave from the focus of the reflector which, in turn, creates a planar wave from the incident spherical wave. The test zone of the reflector accurately simulates far-field conditions for antenna or target under test.

Products - Compact Ranges

Series 5700 Compact Ranges - continued

Why Use An Indoor Compact Range?

When you conduct antenna and radar cross-section testing indoors, your test schedule is virtually unaffected by weather conditions and the time of day. In an enclosed structure, security presents less of a problem. However, the costs associated with the construction of a large indoor facility may not be justified by the increased productivity.

An antenna of three-foot diameter tested at 10 GHz will typically require a separation of 183 ft (56 m) between the microwave source and the antenna under test (AUT). The cost of the structure to house this range along with the large volume of microwave absorber required inside would be nearly prohibitive.

A compact range is the answer to this problem. By using the MI Technologies Model 5703, this test is conducted over 18 ft (5.5 m) of separation — a 90 percent reduction in this distance. The use of a compact range, like the Model 5703, makes the enclosed range practical to build and maintain.

With a compact range, you will also find that your measurements are not affected by wind gusts and temperature inversions, which can degrade phase and position data or skew the RF beam. An indoor facility will require less maintenance than an outdoor facility. In addition, the compact range may eliminate the cost of high power amplifiers.

MI Technologies compact ranges possess some unique qualities that ensure the quality of your measurement.

Virtual Vertex

The vertex of the parabolic design is placed below the surface of the reflector at a “virtual” point in space, a design that allows the source feed to be located away from the path of the collimated energy that fills the test zone. This feature maximizes the dynamic range of radar cross-section measurements by reducing range related clutter.

Prime Focus

MI Technologies’ prime focus design uses only a single reflector. Multiple reflector designs cannot match the frequency range covered by single reflector ranges. Moreover, less space is utilized by using a single reflecting surface. A single reflector gives superior ring-down performance not realizable by dual reflector systems for RCS testing.

Precision Machined Surface

MI Technologies reflectors are machined as one piece with our proprietary machining process. This process provides superior surface accuracy while making complicated panel alignments (and periodic realignments) unnecessary.

Steel Backup Structure

All backup structures are of welded structural steel for maximum stiffness. This structure yields a temperature stability double that provided by aluminum backup structures.

Serrated Edges

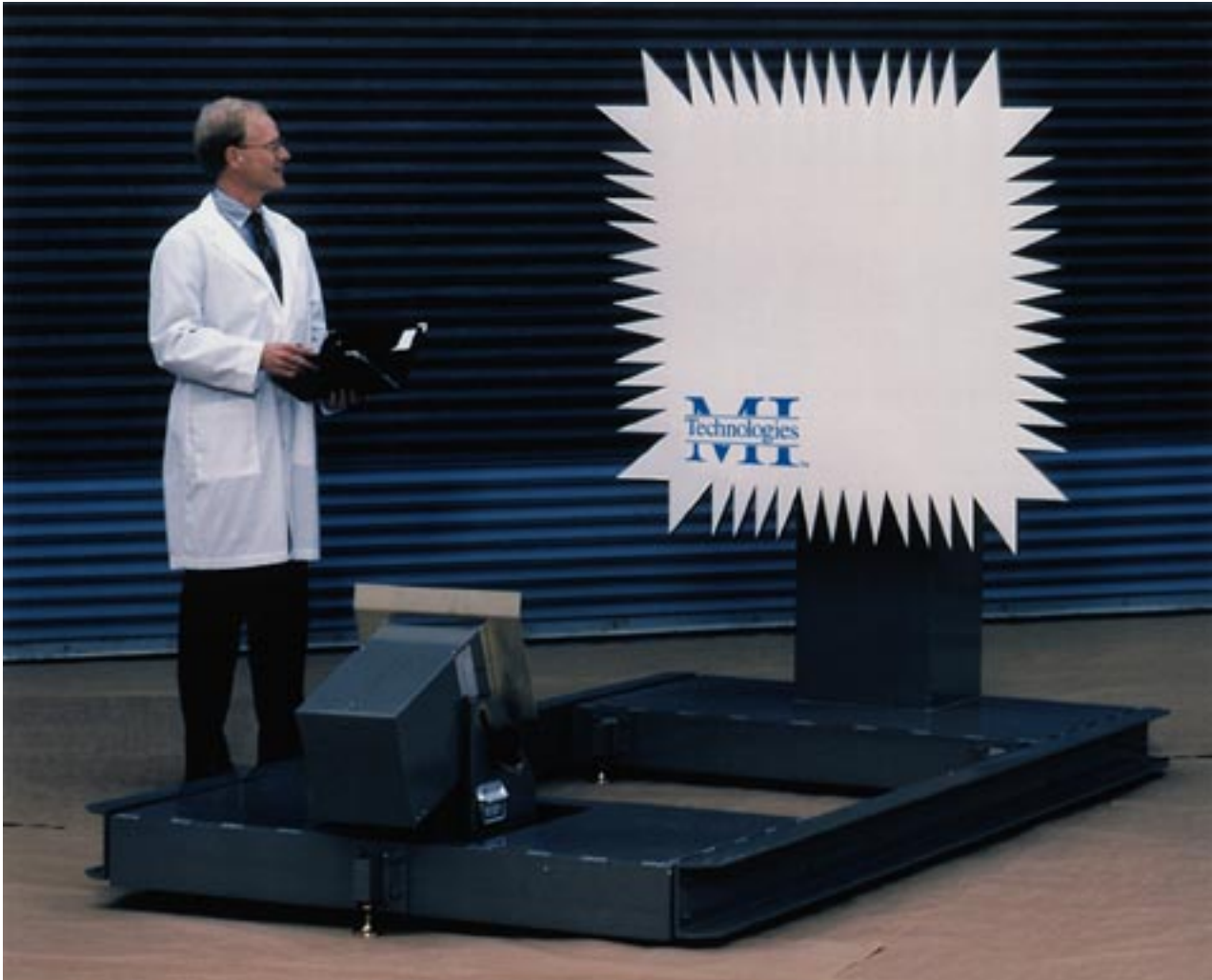
Serrated edges gradually taper the amplitude distribution at the edges of the test zone. Edge design is an important consideration when measuring low-level sidelobes or low RCS targets.

Room Size

The virtual vertex compact range is designed to minimize your investment in facilities without compromising the accuracy of your measurements.

Products - Compact Ranges

Series 5700 Compact Ranges - continued



The Model 5702 Compact Range

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Selecting a MI Technologies Compact Range

Before any antenna or RCS measurements begin, the right facility must be selected, designed, and built. Both the facility and the compact range selected depend on your testing objectives. You'll want to address questions concerning test requirements, frequency range, test article dimensions, accuracy specifications, and desired budget during the design phase.

MI Technologies can provide facility recommendations for measurement applications. Our engineering professionals are available to help with especially difficult measurement problems. MI Technologies can also recommend one of our antenna or target positioners along with our automatic measurement systems for maximum productivity in your new range facility. Once you've made your selection, MI Technologies will install the compact range in your facility.

The Models 5701, 5702, 5703, 5704, 5706, 5708, and 5712 compact ranges encompass a wide range of frequencies, test zone sizes, and focal lengths. The smaller 5701 and 5702 models are used primarily for millimeter wave testing, while the larger 5703, 5704, and 5706 provide wide frequency coverage at a focal length of 12 ft (3.7 m). The largest ranges, the 5708 and 5712, use a 24 ft (7.4 m) focal length while providing a test zone that is 12 ft (3.7 m) wide.

Every compact range is installed by trained professionals from MI Technologies who focus, align, and test the range for you. If maintenance is required, one of our worldwide service locations will provide prompt service to meet your needs.

Products - Compact Ranges

Series 5700 Compact Ranges - continued

Specifications

| | Model 5701 Horizontal Cylinder | Model 5702 Horizontal Cylinder | Model 5703 Horizontal Cylinder | Model 5704 Horizontal Elliptical Cylinder | Model 5706 Horizontal Cylinder | Model 5708 Horizontal Elliptical Cylinder | Model 5712 Horizontal Cylinder | Custom Designs |
|--|--|---|---|--|---|--|--------------------------------------|--|
| Test Zone Size | 1 ft dia 12 in. long | 2 ft dia 40 in. long | 3 ft dia 3 ft long | 4 ft (H) 6 ft (W) 6 ft (L) | 6 ft dia 6 ft long | 8 ft (H) 12 ft (W) 12 ft (L) | 12 ft dia 12 ft long | Up to 38 ft dia 38 ft long |
| Frequency Range (GHz) | 60-110 | 26.5-100 | 5.8-94 | 2-94 | 2-94 | 1-94 | 1-94 | 1-94 |
| Amplitude Taper (dB) | 0.4 | 0.4 | 0.5 | 1.0 | 1.0 | 1.0 | 1.0- | 1.0 typical |
| Phase Variation | 20° | 20° | 10 ⁰³ 20 ⁰⁴ | 10 ⁰³ 20 ⁰⁴ | 10 ⁰³ 20 ⁰⁴ | 10 ⁰³ 20 ⁰⁴ | 10 ⁰³ 20 ⁰⁴ | 10 ⁰³ 20 ⁰⁴ |
| Cross Polarization ² (Typical) | -30 dB | -30 dB | -30 dB | -30 dB | -30 dB | -30 dB | -30 dB | -30 dB typical |
| Minimum Chamber Size | Portable self-cont. unit | 8 ft (H) 8 ft (W) 15 ft (L) | 11 ft (H) 12 ft (W) 28 ft (L) | 15 ft (H) 20 ft (W) 36 ft (L) | 18 ft (H) 20 ft (W) 36 ft (L) | 30 ft (H) 40 ft (W) 72 ft (L) | 36 ft (H) 40 ft (W) 72 ft (L) | See ⁷ |
| Typical Chamber Sizes for RSC Meas. (Target Dependent) | N/A | N/A | 20 ft (H) 20 ft (W) 28 ft (L) | 28 ft (H) 28 ft (W) 40 ft (L) | 28 ft (H) 28 ft (W) 40 ft (L) | 48 ft (H) 48 ft (W) 80 ft (L) | 48 ft (H) 48 ft (W) 80 ft (L) | See ⁷ |
| Gain Accuracy (Typical) | ±0.5 dB | ±0.5 dB | ±0.25 dB | ±0.5 dB | ±0.5 dB | ±0.5 dB | ±0.5 dB | ±0.5 dB typical |
| Sidelobe Accuracy ^{1,2} (Typical) | -15 dB -30 dB -45 dB | ±0.30 dB ±0.50 dB ±1.75 dB | ±0.30 dB ±0.50 dB ±1.75 dB | ±0.60 dB ±0.80 dB ±2.10 dB | ±0.55 dB ±0.75 dB ±2.00 dB | ±0.55 dB ±0.75 dB ±2.00 dB | ±0.55 dB ±0.75 dB ±2.00 dB | ±0.55 dB typical ±0.75 dB typical ±2.00 dB typical |
| Min. Chamber Entrance Size | 77 in. (H) 55 in. (W) | 80 in. (H) 36 in. (W) | 89 in. (H) ⁶ 45 in. (W) | 120 in. (H) ⁶ 72 in. (W) | 154 in. (H) ⁶ 96 in. (W) | 168 in. (H) 120 in. (W) | | See ⁷ |
| Reflector Dimensions | 26.5 in. (H) 26.5 in. (W) | 52 in. (H) 52 in. (W) | 108 in. (H) 108 in. (W) | 133 in. (H) 186 in. (W) | 148 in. (H) 191 in. (W) | 263 in. (H) 368 in. (W) | | See ⁷ |
| Reflector Weight | 1500 lbs ⁵ | 950 lbs | 1100 lbs | 3500 lbs | 4500 lbs | 12,000 lbs | | See ⁷ |
| Focal Length | 3 ft | 7 ft | 12 ft | 12 ft | 12 ft | 24 ft | 24 ft | See ⁷ |
| Avg. Floor Loading (Max) | 100 ^{lbf} /ft ² (N/A) | 100 ^{lbf} /ft ² (3000 psi) | 130 ^{lbf} /ft ² (3000 psi) | 375 ^{lbf} /ft ² (3000 psi) | 175 ^{lbf} /ft ² (3000 psi) | 500 ^{lbf} /ft ² (3000 psi) | | See ⁷ |

¹ Dependent upon test antenna characteristics.

² Consult factory for special requirements.

³ For frequencies less than 18 GHz.

⁴ For frequencies greater than 18 GHz.

⁵ Entire unit weight.

⁶ Includes typical 12 in. minimum for a forklift truck.

⁷ Size dependent upon customer requirements.

Ordering Information

The Models 5703, 5704, 5706, 5708, and 5712 include a range reflector, feed positioner, installation assistance, alignment and focusing, and performance evaluation at three frequencies in the 1 GHz to 40 GHz range or at a single frequency in the 40 GHz to 94 GHz range. Delivery is F.O.B. destination within the continental U.S. or F.A.S. U.S. Port. for international deliveries.

Installation

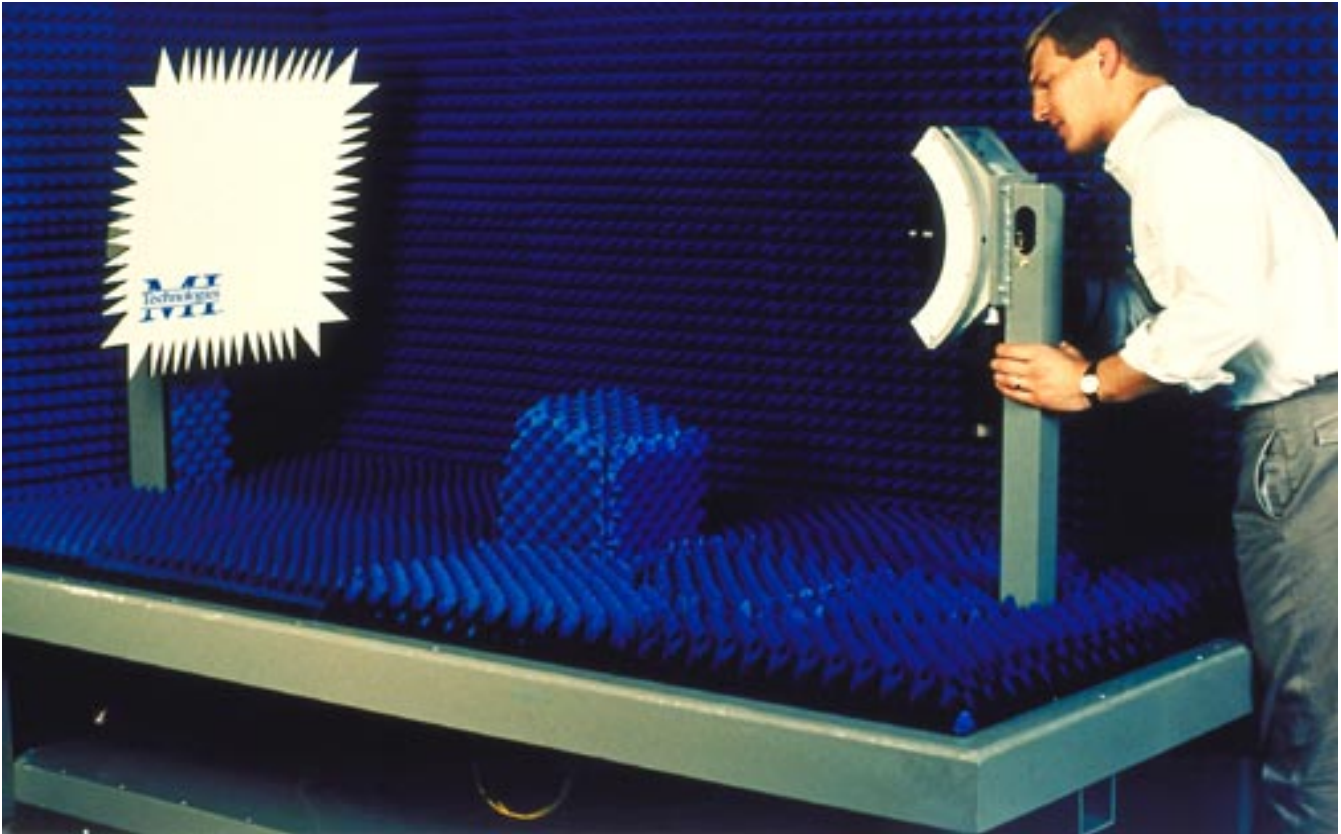
MI Technologies will provide personnel on-site the day of arrival of the reflector for technical support in unloading and installation of the reflector. After the compact range has been positioned with manpower and equipment supplied by the customer, MI Technologies personnel will make final mechanical alignment and determine the location of the reflector and positioner mounting studs.

The Models 5701 and 5702 are pre-aligned and evaluated at the factory. Minimal customer assembly is required. Delivery is F.O.B. destination for all 5701 and 5702 deliveries.

Note that range feeds and compact range positioners are ordered separately.

Products - Compact Ranges

Series 5700 Compact Ranges - continued



The Model 5701 Virtual-Vertex Compact Range

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Options

Not Applicable

Accessories

Range evaluation over additional frequency bands is available – consult sales office.

Compact Range Test Positioners

- 5703 Compact Range Test Positioner Roll/EI/Az/Slide ± 18 in.
- 5704 Compact Range Test Positioner Roll/EI/Az/Slide
- 5706 Compact Range Test Positioner Roll/EI/Az/Slide ± 24 in.
- 5708 Compact Range Test Positioner Roll/EI/Az/Slide ± 48 in.
- 5712 Compact Range Test Positioner Roll/EI/Az/Slide ± 48 in.

Options for Compact Range Test Positioners

- ()-101 RF path (DC-4 GHz) and RF switch wiring twist loop (no rotary joint or slip ring, ± 200 deg. of rotation)
- ()-102 Precision RF path (DC-12.4 GHz) with coaxial rotary joint for continuous rotation (no RF switch wiring included)
- ()-103 Precision RF path (DC-12.4 GHz) and RF switch wiring (coaxial rotary joint and 13 conductor slip ring for continuous rotation)
- ()-104 2.8 dia. thorough hole (limited elevation travel $+10^\circ$ to -35° reference outline drawing number 318640)
- ()-201 RF path (DC-4 GHz), RF switch wiring, and auxiliary axis wiring. No slip ring or coaxial rotary joint included
- ()-202 Precision RF path (DC-12.4 GHz), RF switch wiring Slip ring and coaxial rotary joint included
- ()-301 Roll axis encoder (not available when options 202 and 302 are specified together)

Products - Compact Ranges

Series 5700 Compact Ranges - continued

()-302 Elevation axis encoder (not available when options 202 and 301 are specified together)

()-303 Azimuth axis encoder

()-450 50 Hz operation

()-460 60 Hz operation

Compact Range Feeds

| Model | Frequency Range |
|------------|-------------------|
| 31-2.6 M | 2.60 - 3.95 GHz |
| 31A-2.6 M | 2.60 - 3.95 GHz |
| 31-3.9 M | 3.95 - 5.85 GHz |
| 31A-3.9 M | 3.95 - 5.85 GHz |
| 31-5.8 M | 5.85 - 8.20 GHz |
| 31A-5.8 M | 5.85 - 8.20 GHz |
| 31-8.2 M | 8.20 - 12.40 GHz |
| 31A-8.2 M | 8.20 - 12.40 GHz |
| 31-12.4 M | 12.40 - 18.00 GHz |
| 31A-12.4 M | 12.40 - 18.00 GHz |

| | |
|-----------|-----------------|
| 32 - 1.1 | 1.1 - 1.7 GHz |
| 32 - 1.0 | 1.0 - 1.3 GHz |
| 32 - 1.3 | 1.3 - 2.0 GHz |
| 32 - 2.0 | 2.0 - 2.7 GHz |
| 32 - 2.7 | 2.7 - 4.0 GHz |
| 32 - 4.0 | 4.0 - 5.5 GHz |
| 32 - 5.5 | 5.5 - 8.0 GHz |
| 32 - 8.0 | 8.0 - 12.0 GHz |
| 32 - 12.0 | 12.0 - 18.0 GHz |

| | |
|-----------|-----------------|
| 33 - 0.75 | 0.75 - 1.1 GHz |
| 33 - 1.1 | 1.1 - 1.7 GHz |
| 33 - 1.7 | 1.7 - 2.6 GHz |
| 33 - 2.6 | 2.6 - 3.95 GHz |
| 33 - 3.95 | 3.95 - 5.85 GHz |
| 33 - 5.85 | 5.85 - 8.2 GHz |
| 33 - 8.2 | 8.2 - 12.4 GHz |
| 33 - 12.4 | 12.4 - 18.0 GHz |
| 33 - 18.0 | 18.0 - 26.5 GHz |
| 33 - 26.5 | 26.5 - 40.0 GHz |
| 33 - 40.0 | 40.0 - 60.0 GHz |
| 33 - 60.0 | 60.0 - 94.0 GHz |



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Typical Compact Range Test Positioner